

COURSE SYLLABUS

CSC12003 – Database Management Systems

1. GENERAL INFORMATION

Course name:	Database Management Systems
Course name (in Vietnamese):	Hệ quản trị cơ sở dữ liệu
Course ID:	CSC12003
Knowledge block:	Compulsory for Information System major
Number of credits:	4
Credit hours for theory:	45
Credit hours for practice:	30
Credit hours for self-study:	90
Prerequisite:	None
Parallel-course:	None
Prior-course:	CSC10006 - Introduction to Database Systems

2. COURSE DESCRIPTION

This course is designed to provide students concepts, principles and techniques used in relational database management systems. The course helps students to operate on a relational database consistently using transactions. Students are also introduced concurrency control techniques used in a RDBMS for ensuring correctness and effectiveness in an information system. Students could understand techniques used for database recovering from failures in a DBMS. Students could also apply security mechanisms provided by a DBMS. In addition, they could understand how data is stored and retrieved on storage devices. Students are also introduced the query processing algorithms and query optimization methods. In particular, students are guided to work in group on exercises or course projects. Students are also instructed to perform reading comprehension skills and writing simple reports in English.

3. COURSE GOALS

At the end of the course, students are able to

ID	Description	Program LOs
G1	Work independently or in group to apply principles of RDBMSs	2.1.1, 2.2.2
G2	Perform the reading comprehension skills, present and write simple reports in English	2.3.1, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 2.4.4
G3	Use the functions of a RDBMS, analysis and design to solve real-world information systems	4.1, 4.3, 5.2, 5.3
G4	Describe the general architecture of a DBMS	1.3.5
G5	Operate on a relational database consistently using transaction processing concepts and theory	1.3.5.3, 1.3.6
G6	Use concurrency control techniques provided by DBMSs	1.3.6, 1.4.1, 5.1, 5.2, 5.3
G7	Describe the techniques used in DBMSs for database recovery from failures	1.3.6, 1.4.1
G8	Apply security mechanisms provided by DBMSs in real-world applications	1.3.6, 1.4.1, 5.1, 5.2, 5.3
G9	Comprehend the way data is stored or retrieved on storage devices	1.3.6, 1.4.1, 5.1, 5.2, 5.3
G10	Comprehend the query processing algorithms and query optimization methods	1.3.6, 1.4.1
G11	Apply functions provided by SQL Server together with a programming language in real-world information systems	1.3.6, 5.1, 5.2, 5.3

4. COURSE OUTCOMES

CO	Description	I/T/U
G1.1	Demonstrate independent work on quizzes and homework	T, U
G1.2	Demonstrate working in pair or group on the project	T, U
G2.1	Conduct textbook reading on different chapters and summarize the key features	I, T, U
G2.2	Show the understanding on a given topic of a DBMS and its application via report writing	T, U
G3.1	Apply principles of a DBMS to analyze an information system	T, U
G3.2	Apply functions provided by a DBMS to design an information system	T, U
G4.1	Describe the roles and relationships between components of a DBMS	T, U
G5.1	Describe the desirable properties of transactions	T, U
G5.2	Operate on database consistently using transactions	T, U
G6.1	Describe concurrency control techniques used in RDBMSs	T, U
G6.2	Apply some concurrency control technique in real-world information systems	T, U
G7.1	Describe database recovery techniques used in RDBMSs	I, T
G7.2	Explain the state of databases after recovery from failures	I, T
G8.1	Show the understanding on security mechanisms used in DBMSs	I, T
G8.2	Apply security mechanisms to enforce the security policies in real-world information systems	T, U
G9.1	Show understanding on the way to store and retrieve data on storage devices	I, T
G9.2	Apply indexing structures for files properly and effectively in real-world information systems	T, U

G10.1	Show understanding on typical steps when processing (high-level) queries and algorithms used in query processing	I, T
G10.2	Describe query optimization techniques (using heuristic rules or selectivity and cost estimates)	I, T
G11.1	Conduct the implementation a database on SQL Server in real-world information systems based on functions provided by SQL Server	T, U
G11.2	Develop an application on an implemented database.	I, T, U

5. TEACHING PLAN

THEORY

ID	Topic	Course outcomes	Teaching/Learning Activities (samples)	Assessments
1	Introduction to DBMSs	G1.1, G2, G4.1	Lecturing Q&A, Group discussion	
2	Transaction	G1.1, G2, G3, G4.1, G5	Lecturing Demonstration, Q&A QZ2: Quiz 2	LAB
3	Exercises	G1.1, G2, G3, G4.1, G5	Demonstration Group discussion	
4	Concepts and theory about concurrency control	G1.1, G1.2, G2, G6	Lecturing Demonstration, discussion	MID, FIN
5	Two-phase locking techniques for concurrency control	G1.1, G2, G6	Lecturing	MID, FIN

			Demonstration, discussion	
6	Deadlock Prevention	G1.1, G2, G6	Lecturing Demonstration	MID, FIN
7	Exercises	G1.1, G2, G6	Demonstration Group discussion	
8	Isolation levels and Lock modes	G1.1, G1.2, G2.1, G3, G6	Question & answer Case study and discussion	LAB
9	Concurrency control based on timestamp ordering	G1.1, G2, G6	Lecturing Demonstration	MID, FIN
10	Validation concurrency control techniques	G1.1, G2, G6	Lecturing Q&A, discussion	MID, FIN
11	Exercises	G1.1, G2, G6	Demonstration Group discussion	
12	Database recovery techniques Database security and authorization	G1, G2, G3, G7, G8	Lecturing	MID, FIN
13	Data storage and indexing structures for files	G1.1, G2.1, G3, G9	Case study, discussion Demonstration	LAB
14	Algorithms for query processing and optimization	G1.1, G2.1, G10	Lecturing Q&A, Discussion Project submitted	MID, FIN
15	Review			

LABORATORY

ID	Topics	Course Outcomes	Teaching/ Learning activities
1	Review: SQL, stored procedure, transaction	G11	Explain and demonstrate
2	Transaction Project assignment	G5, G11	Provide instruction
3	Concurrency control, isolation levels, lock modes	G6, G11	Provide instruction
4	Concurrency control and application programming (using SQL Server and .Net or Java)	G6, G11	Explain and demonstrate
5	Database backing up and recovery Database recovery from failures	G7, G11	Provide instruction
6	Authentication & DAC	G8, G11	Provide instruction
7	RBAC	G8, G11	Provide instruction
8	Windows Forms programming with .Net, Java	G11	Provide instruction
9	Application programming with database and .Net, Java	G11	Provide instruction
10	Application programming using 3- layer or MVC models with .Net, Java	G11	Provide instruction

6. ASSESSMENTS

ID	Topic	Description	Course outcomes	Ratio (%)
LAB	Laboratory			30%
MID	In-class exercises and Homework			20%
FIN	Final exam	Open book exam.		50%

7. RESOURCES

Textbooks

- [1] Elmasri & Navathe, *Fundamentals of database systems*, Pearson Education Inc., 7th edition, 2017.
- [2] H. Garcia-Molina, J. D. Ullman, J. Widom, *Database systems: The complete book*, Prentice Hall, 2nd edition, 2014.

Reference books

- [3] A. Silberschatz, H. F.Korth, S. Sudarshan, *Database System Concepts*, McGraw-Hill, 2010.

Software

Microsoft SQL Server (or Oracle, or DB2)

Java, .NET

8. GENERAL REGULATIONS & POLICIES

- All students are responsible for reading and following strictly the regulations and policies of the school and university.
- Students who are absent for more than 3 theory sessions are not allowed to take the exams.
- For any kind of cheating and plagiarism, students will be graded 0 for the course. The incident is then submitted to the school and university for further review.

- Students are encouraged to form study groups to discuss on the topics. However, individual work must be done and submitted on your own.